

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
9 August 2001 (09.08.2001)

PCT

(10) International Publication Number
WO 01/57581 A3

(51) International Patent Classification⁷: **G02B 27/48** (74) Agents: HAVERSTOCK, Thomas, B. et al.; Haverstock & Owens LLP, 162 North Wolfe Road, Sunnyvale, CA 94086 (US).

(21) International Application Number: **PCT/US01/40049**

(22) International Filing Date: 6 February 2001 (06.02.2001) (81) Designated States (national): CA, JP, KR.

(25) Filing Language: English (84) Designated States (regional): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR).

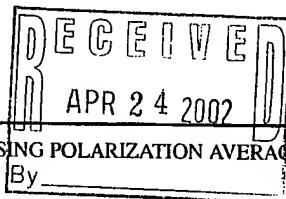
(26) Publication Language: English

(30) Priority Data: Published:
09/498,703 7 February 2000 (07.02.2000) US — with international search report

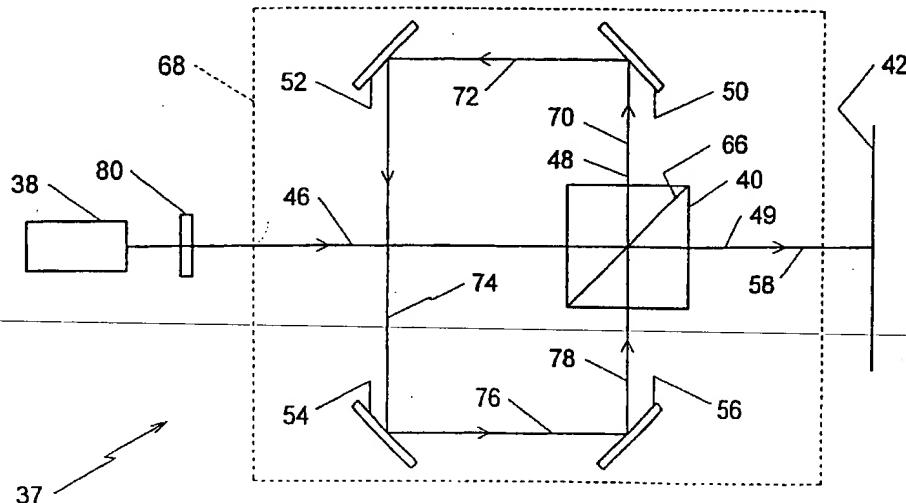
(71) Applicant: **SILICON LIGHT MACHINES [US/US]; Suite 115, 385 Moffett Park Drive, Sunnyvale, CA 94089 (US).** (88) Date of publication of the international search report: 11 April 2002

(72) Inventor: **TRISNADI, Jahja, I.; 21800 San Fernando Ave, Cupertino, CA 95014 (US).**

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.



(54) Title: **METHOD AND APPARATUS FOR REDUCING LASER SPECKLE USING POLARIZATION AVERAGING**
By _____



WO 01/57581 A3

(57) Abstract: A method and apparatus for reducing speckle uses polarization averaging. A polarizing beam splitter divides a first polarized laser output into a second polarized laser output and a third polarized laser output. A plurality of mirrors creates an optical path difference between the second and third polarized laser outputs. The optical path difference is at least about a coherence length for the first polarized laser output. The second and third polarized laser outputs are combined into a fourth laser output, which illuminates a depolarizing screen. If a human eye or an optical system having an intensity detector views the depolarizing screen, the eye or the intensity detector will detect reduced speckle, which results from uncorrelated speckle patterns created by the second polarized laser output and the third polarized laser output.

THIS PAGE BLANK (USPTO)

THIS PAGE BLANK (USPTO)

INT. NATIONAL SEARCH REPORT

International Application No
PCT/US 01/40049

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G02B27/48

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G02B G03H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, PAJ, EPO-Internal, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	<p>US 5 463 497 A (IMAI SHUNZO ET AL) 31 October 1995 (1995-10-31)</p> <p>column 14, line 29 - line 67 column 15 -column 17 page 18, line 1 - line 2 figures 9A-9C</p> <p>---</p> <p>-/-</p>	<p>1,16,19, 34,41, 44,50, 56,59, 62,63</p>

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claims(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

& document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

20 November 2001

11/12/2001

Name and mailing address of the ISA
European Patent Office, P.B. 5818 Palentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl.
Fax: (+31-70) 340-3016

Authorized officer

Ward, S

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GOODMAN J W : "Some Fundamental Properties of Speckle" JOURNAL OF THE OPTICAL SOCIETY OF AMERICA, vol. 66, no. 11, November 1976 (1976-11), pages 1145-1150, XP002181682 NEW YORK US page 1147, right-hand column, paragraphs 3, 4 page 1148, left-hand column, paragraph 3 ---	1, 16, 19, 34, 41, 44, 50, 56, 59, 62, 63
A	US 4 511 220 A (SCULLY CHARLES N) 16 April 1985 (1985-04-16) abstract; figures ---	1-68
A	US 5 233 460 A (PARTLO WILLIAM N ET AL) 3 August 1993 (1993-08-03) abstract; figures ---	1-68
A	KUNDU P C ET AL: "REDUCTION OF SPECKLE NOISE BY VARYING THE POLARISATION OF ILLUMINATING BEAM" JOURNAL OF OPTICS, vol. 4, no. 3, 1975, pages 63-67, XP002183475 MASSON, PARIS., FR ISSN: 0150-536X the whole document -----	1-68

INT'L NATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/40049

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
US 5463497	A	31-10-1995	JP	2770984 B2		02-07-1998
			JP	3011614 A		18-01-1991
			JP	2969718 B2		02-11-1999
			JP	3215930 A		20-09-1991
			JP	2765162 B2		11-06-1998
			JP	3252122 A		11-11-1991
			US	5153773 A		06-10-1992
US 4511220	A	16-04-1985		NONE		
US 5233460	A	03-08-1993		NONE		

THIS PAGE BLANK (USPTO)